



Reactivity of Metals Lab

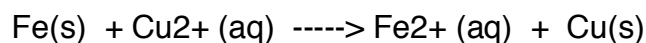
Name _____BLK_____

Introduction

The metallic elements share the properties of luster, ductility, malleability, and electrical conductance. The chemistry of the metals is based on their ability to lose electrons. Differences in chemical reactivity between two metals depend upon the relative ease with which the metals give up electrons.

The application a metal is used for depends in part on its chemical reactivity. For example, gold, which is commonly used in jewelry, is highly resistant to chemical reactions. Sodium however is not used in jewelry because it is so reactive it will explode if it contacts water.

You can measure the relative reactivity of two metals by placing a small pure sample of one metal in a solution containing the ions of the other metal. If the small metal sample is more reactive than the metal whose ions are in solution, electrons will move from the solid metal sample into the solution. For example, a piece of iron placed in a solution containing copper(II) ions will corrode, while fine copper particles deposit on the iron. However, no reaction occurs when a strip of copper metal is placed in a solution of iron(II) ions. This spontaneous reaction is shown below.



In this experiment, you will test the reactivity of a variety of metals with different metal ions. You will then use the result of your tests to construct a scale of relative reactivity of the metals.

Hint: You can tell if a reaction has taken place if the color of the metal has changed or the color of the solution has changed.

Objectives

1. **Measure** the reactivities of a variety of metals
2. **Classify** the metals used into an activity series.
3. **Identify** the unknown metal samples you collected from Donner or Blitzen

Equipment

Safety goggles
16 test tubes- Or- Well Plate
dropper pipets
solution bottles
known metal samples
unknown samples

Materials:

5% Solutions in dropper bottles of:

lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$	potassium chloride, KCl
copper(II) sulfate, CuSO_4	sodium chloride, NaCl
silver nitrate, AgNO_3	magnesium chloride, MgCl_2
zinc chloride, ZnCl_2	nickel II Chloride, NiCl_2
iron II chloride, FeCl_2	

Pieces of the following pure metals:

copper, Cu	(2 pieces)
lead, Pb	(4 pieces)
zinc, Zn	(3 pieces)
magnesium, Mg	(3 pieces)
tin, Sn	(2 pieces)
iron, Fe	(1 piece)

Procedure As you perform this experiment, record your observations in **Table 1**

1. Use steel wool to shine the strips of Mg and Pb (if possible)

2. Label the test tubes 1-16 **OR- label photocopy of well plate 1-16 and place the well plate on the photocopy**

To test tubes labeled	1, 3, 8	add 5 drops of PbNO₃ .
To test tubes labeled	2 and 4	add 5 drops of AgNO₃
To test tubes labeled	5 and 16	add 5 drops of NiCl₂
To test tubes labeled	6 and 10	add 5 drops of FeCl₂
To test tubes labeled	7 and 14	add 5 drop of CuSO₄
To test tube labeled	9	add 5 drops of MgCl₂
To test tubes labeled	11 and 15	add 5 drops of ZnCl₂
To test tube labeled	12	add 5 drops of NaCl
To test tube labeled	13	add 5 drops of KCl

3. Testing Metal Reactivity

- To test tubes labeled **1 and 2** add a piece of **copper metal to each**. **Record your observations on the Data Sheet.**
- To test tubes labeled **3, 4, 5, and 6** add a piece of **lead to each**. **Record your observations on the Data Sheet.**
- To test tubes labeled **7,8,9, and 10** add a piece of **zinc to each**. **Record your observations on the Data Sheet.**
- To test tubes labeled **11, 12, and 13** add a piece of **magnesium to each**. **Record your observations on the Data Sheet.**
- To test tubes labeled **14 and 15** add a piece of **tin**. **Record your observations on the Data Sheet**
- To test tube labeled **16** add a piece of **iron**. **Record your observations on the Data Sheet**

Data Sheet - Observations of your results:

Test Tube	5% Metal Solutions	Pure Metal	Observations	Reaction (Y/N)
1.	Pb			
2.	Ag			
3.	Pb			
4.	Ag			
5.	Ni			
6.	Fe			
7.	Cu			
8.	Pb			
9.	Mg			
10.	Fe			
11.	Zn			
12.	Na			
13.	K			
14.	Cu			
15.	Zn			
16.	Ni			

Conclusions

1. Write balanced chemical equations for the reaction that occurred below.

2. Using data from your experiments, list the metals in order of decreasing activity.
most active least active

3. How does your list compare with the reactivity series on your reference sheet? Do you think your results were correct?

4. Based on your results predict how the following reactions would proceed.....

Pb metal + NaCl

Mg metal + CuSO₄

Zn metal + AgNO₃

Donner and Blitzen: UNKNOWN SAMPLES TEST

ON A SEPARATE SHEET OF PAPER, as you perform this experiment, record your observations in a table (similar to Table 1) that you make up.

1. Sort your metal samples according to appearance. You will need to you small amounts of the similar appearing metals in the following test.
2. Use steel wool to shine any metal that seems dull.
3. Label the test tubes 1-9 **OR- label photocopy of well plate 1-9 and place the well plate on the photocopy**
4. Place the following solutions in each of the wells:

1. lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$	6. potassium chloride, KCl
2. copper(II) sulfate, CuSO_4	7. sodium chloride, NaCl
3. silver nitrate, AgNO_3	8. magnesium chloride, MgCl_2
4. zinc chloride, ZnCl_2	9. nickel II chloride, NiCl_2
5. iron II chloride, FeCl_2	
5. Next, place 1 small piece of the **sorted** sample in each of the wells and record your observations. *For Example- place one piece of the gold colored metals into each of the 9 wells and record the reactions.*
6. Once done with your first sample, do the same procedure for your second sample. *For Example, place one piece of the red colored metal into each of the 9 wells and record the reactions.*
7. Continue with this procedure until all the different appearing metals have been tested.
8. On the same paper (s) as your table, list what kinds of metals you think were in your soil sample and how your team came to that conclusion.
9. How do the results affect your plans for Donner or Blitzen?

HONORS

10. Write and balance the equations that identified each of your unknown metal samples.